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WOODWARD-CLYDE CONSULTANTS PLYMOUTH MEETING PA
NATIONAL DAM INSPECTION PROGRAM. POLE RUN DAM NUMBER 4 (NDS ID --ETC(U)
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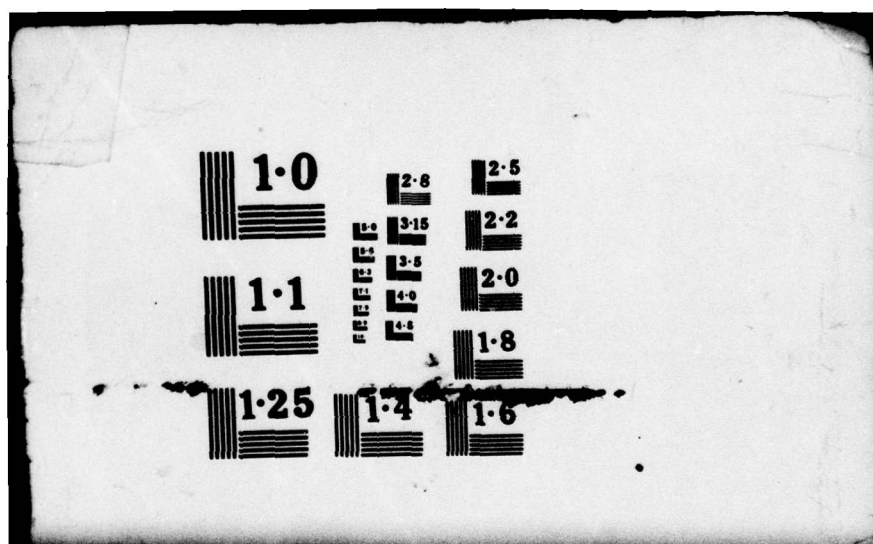
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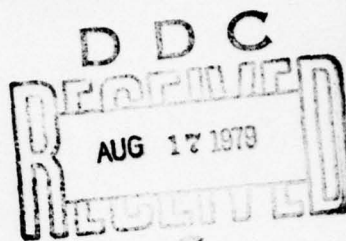


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**SUSQUEHANNA RIVER BASIN
POLE RUN CREEK
SCHUYLKILL COUNTY**

**PENNSYLVANIA
NDS ID PA. 00686
DER ID 54-36**



POLE RUN DAM NO. 4

PHASE I INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM

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**DEPARTMENT OF THE ARMY
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Baltimore, Maryland 21203**

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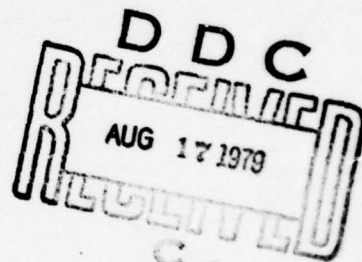
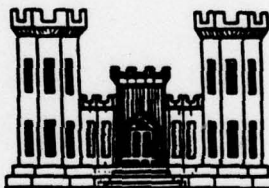
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ID 54-36), Susquehanna River Basin, Pole
Run Creek, Schuylkill County,
Pennsylvania. Phase I Inspection Report.
SUSQUEHANNA RIVER BASIN

POLE RUN, SCHUYLKILL COUNTY
PENNSYLVANIA

POLE RUN DAM NO. 4

NDS I.D. NO. PA 00686
DER I.D. NO. 54-36

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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12 78p.

Prepared by:

WOODWARD-CLYDE CONSULTANTS
5120 Butler Pike
Plymouth Meeting, Pennsylvania 19462

Submitted to:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D. C., 20314. The purpose of a Phase I investigation is to expeditiously identify those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for more detailed studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected, and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

**PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**

Name of Dam:	Pole Run Dam No. 4
County Located:	Schuylkill County
State Located:	Pennsylvania
Stream:	Pole Run
Coordinates:	Latitude 40° 50.4' Longitude 76° 7.6'
Date of Inspection:	10 April 1979

Pole Run Dam No. 4, owned by the Mahanoy Township Water Authority, is used as a supplemental water supply source for Mahanoy City and surrounding area. The structure was built in 1877 and, in 1956, Gannett, Fleming, Corddry and Carpenter, Inc., designed the existing spillway.

The facility is judged to be in generally poor condition and should be considered a non-emergency unsafe structure. Reasons for this evaluation include the irregular upstream and downstream slopes showing evidence of long-term movement; the presumably unserviceable pond drain system; and the lack of reasonable upstream freeboard even during normal storage. In addition, the embankment has surface cracks along the crest and elliptical depressions along the downstream toe which may be scars from previous old, shallow surface slides. Clear seepage was also noted along the downstream toe and beneath the main discharge pipe. Furthermore, there is no engineering or construction data available by which a stability evaluation could be performed.

The spillway passes significantly less than 20 percent of the PMF without overtopping. Furthermore, it is expected the embankment would fail during 0.5 PMF or greater events. In the event of failure as a result of overtopping, increased property damage is expected from this "High" hazard, "Small" size structure. Therefore, the spillway is considered to be "Seriously Inadequate".

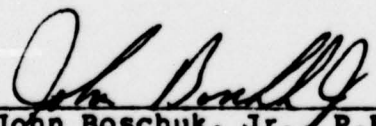
Considering the condition of the dam, the seepage noted, signs of movement and overall deterioration of the structure, as well as the seriously deficient spillway, the following recommendations are presented. All work should be performed under the direction of a registered professional engineer experienced in dam design.

1. A geotechnical investigation, which includes test borings, undisturbed samples, and piezometers or observation wells, should be performed.
2. The spillway system should be reconstructed to meet current hydrologic/hydraulic criteria as determined from a detailed hydrologic/hydraulic analysis.
3. Seepage along the downstream slope and beyond the toe of the dam should be collected and monitored for turbidity and changes in rates of seepage. Remedial measures should be taken if deemed appropriate after an analysis by the engineer.

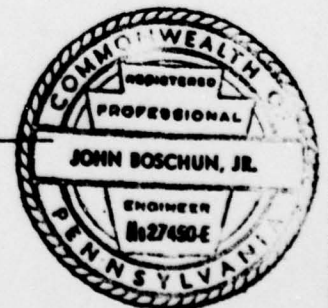
The following items are considered important and should be performed as soon as practical.

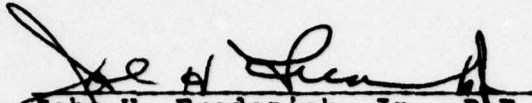
1. Trees and other vegetation should be removed from the slopes.
2. The outlet works should be inspected and repaired, as necessary, to bring the system back to a serviceable condition.
3. Provisions should be made in the event of an emergency for upstream closure of the pond drains.

A formal maintenance/operational and warning procedure should be developed and implemented for this facility. The maintenance/operational procedure should contain a checklist to insure that all items are periodically inspected and maintained in the best possible condition. The warning procedure should establish a method of warning downstream residents when high flows are expected. Evacuation procedures should also be developed.


John Boschuk, Jr. P.E.
Pennsylvania Registration 27450E
Woodward-Clyde Consultants

6/16/77
Date

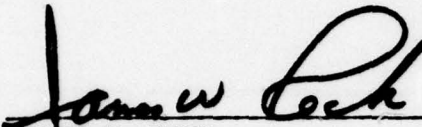



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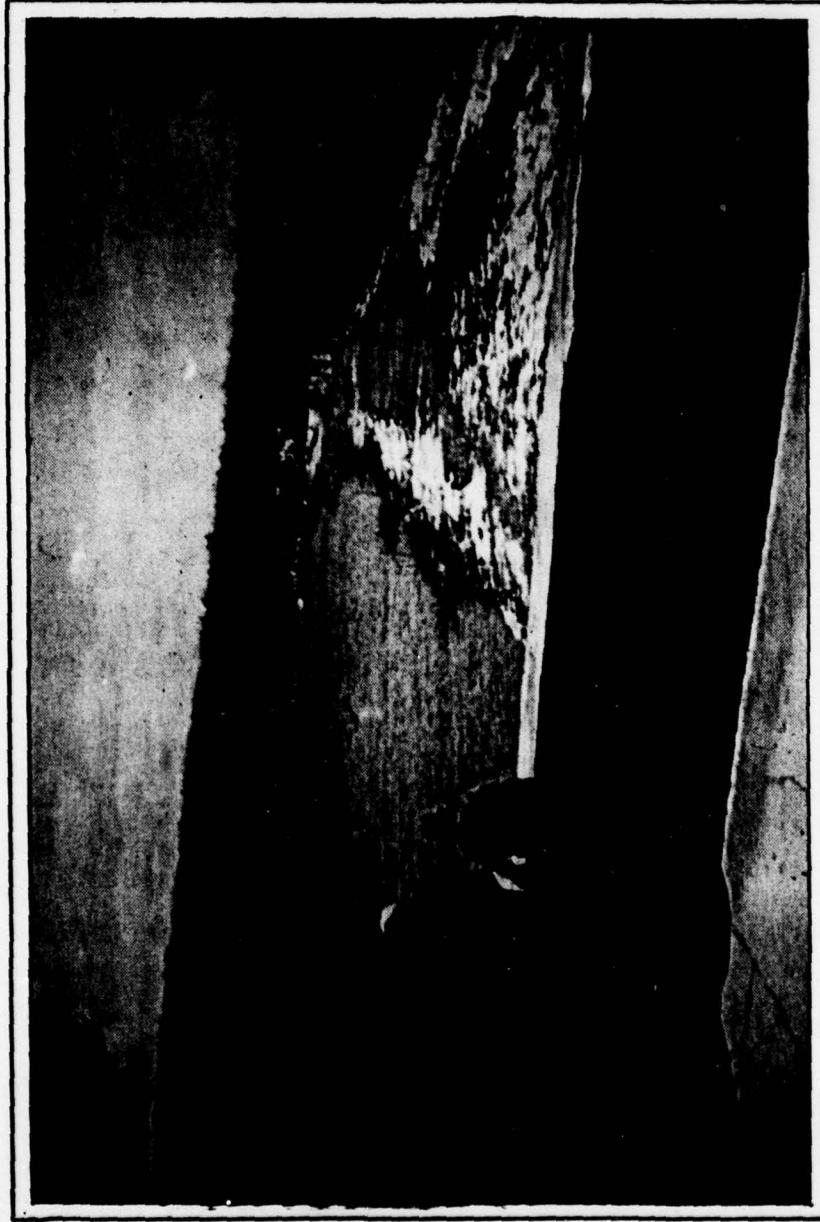
6/16/79
Date



APPROVED BY:


JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

17 JUL 79
Date



OVERVIEW
POLE RUN DAM NO. 4, SCHUYLKILL COUNTY, PENNSYLVANIA

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
POLE RUN DAM NO. 4
NATIONAL ID #PA 00686
DER #54-36

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Pole Run Dam No. 4 is a 30 foot high earthen embankment across Pole Run, a tributary of North Mahanoy Creek. The 780 foot long dam impounds a nine acre reservoir within an 0.58 square mile drainage basin. Very limited data exists regarding the physical features of the dam. The average measured downstream slope is 2H:1V, and the slope is covered with stone and vegetation, ~~as shown on Photograph 6.~~ Since the average freeboard of the structure is less than one foot at normal pool level, the upstream slope could not be measured. A portion of the upstream slope is covered with stone, and this stone could be seen to extend at least two feet below the water and it is probable that it extends several feet below that elevation. The crest width ranges from 15 feet to 27 feet.

The spillway is located at the right abutment, ~~as shown on Plate 2, Appendix E,~~ and consists of an open concrete channel with concrete retaining walls. The water supply intakes could not be inspected as they are below water and the pipes are buried in the embankment. The outlet pipes were inspected and three pipes were found, ~~as shown on Plate 2, Appendix E.~~ Near the toe of the dam, valves were located which are presumably used to control flow through the pipes.

b. Location. The dam is located across Pole Run, a tributary of North Mahanoy Creek in Mahanoy Township, Schuylkill County, Pennsylvania. The dam is located approximately

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3,500 feet north of Shoemakers, Pennsylvania. The dam site and reservoir are shown on USGS Quadrangle entitled "Shenandoah, Pennsylvania" at coordinates N 40° 50.4' W 76° 7.6'. A regional location plan is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as a "Small" size dam by virtue of its 30 foot height and 115 acre-foot total storage capacity.

d. Hazard Classification. A "High" hazard classification is assigned consistent with the potential for extensive property damage and loss of life downstream at Shoemakers, Pennsylvania, and farther downstream at Bowmans, Pennsylvania, which is just north of Mahanoy City.

e. Ownership. Mahanoy Township Water Authority owns and maintains this dam. All correspondence should be sent to Mr. George Palmer, Manager, Mahanoy Township Water Authority, 46 North Main Street, Mahanoy City, Pennsylvania 17948.

f. Purpose of the Dam. The dam is used as a supplemental water supply source for Mahanoy City and surrounding area.

g. Design and Construction History. The dam was built in 1877 by the Mahanoy City Water Company under the direction of Mr. Mark D. Bowman, engineer for the company. As reported in the December 4, 1914, "Report Upon the Pole Run Dam No. 4 of the Mahanoy City Water Company":

"No plans or specifications were prepared and, as Mr. Bowman is now dead, no reliable information was obtained with reference to construction methods and details."

"No record of preliminary investigations for foundations was discovered and it is probable that none were made."

"The up and downstream slopes are protected with riprap of conglomerate boulders."

"From the best information obtainable it is the writer's impression that no core or cut-off walls were constructed."

"There are two 10 inch pipe outlets through the embankment, one near the left end which is above the original ground surface in the reservoir but which passes beneath the ground surface before the downstream toe is reached. The water was at a low stage at the time of the field

examination and this pipe was exposed. It extends into the reservoir about 10 feet beyond the toe of the embankment and is protected merely with conglomerate boulders packed around the pipe."

The spillway was replaced in 1956. The engineer was Gannett Fleming Corddry & Carpenter, Inc.

h. Normal Operating Procedures. The manager for the water company indicates that the valves for flow downstream are only exercised when supplemental water is needed during a period of drought. These valves are rarely opened. The ungated spillway requires no operation.

1.3 Pertinent Data.

A summary of pertinent data for Pole Run Dam No. 4 and reservoir is presented as follows.

a.	Drainage Area (sq miles)	0.58
b.	Discharge at Dam Site (cfs)	
	Maximum Known Flood (Tropical Storm Agnes) Estimated	Unknown ⁽¹⁾
	At Top of Dam (low point)	60
c.	Elevations (feet above MSL) ⁽²⁾	
	Top of Dam	
	At Maximum Section	1,712.0
	Low Point at Left Abutment	1,711.7
	Spillway Weir Crest	1,711.0
	Water Supply Invert	Unknown
	Normal Pool	1,711.0
d.	Reservoir (feet)	
	Length at Normal Pool	800
	Fetch at Normal Pool	800
e.	Storage (acre-feet)	
	Normal Pool	106
	Top of Dam	115

(1) Based on HEC-1, Rev., computer runs using "Best Estimate" values, it is judged that the dam most likely overtopped for at least a short period of time.

(2) All elevations are based on a spillway elevation of 1,711 taken from USGS map.

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f.	Reservoir Surface (acres)	
	Normal Pool	9
g.	Dam Data	
	Type	Earth
	Length	780 feet
	Height	30 feet
	Crest Width (varies)	15 to 27 feet
	Side Slopes	
	Upstream	Unknown
	Downstream (approximate)	2H:1V
	Cutoff	Unknown
	Grout Curtain	Probably None
h.	Water Supply and Blow-Off	
	Water Supply	Two 10" CIP
i.	Spillway	
	Type	Concrete channel.
	Location	Right abutment.
	Width	31.4 feet
	Discharge Chute	Concrete discharging into natural channel

SECTION 2 ENGINEERING DATA

2.1 Design.

a. Availability. A summary of engineering data is presented in the checklist attached as Appendix A. The only significant document available for this investigation was the "Report Upon the Pole Run Dam No. 4 of the Mahanoy City Water Company", prepared by DER, dated December 4, 1914. Other data included miscellaneous correspondence and State of Pennsylvania inspection reports. The correspondence and inspection reports date from the mid-1930's to the latest inspection report, dated April 13, 1971. The 1914 report indicated no design or construction documents ever existed.

b. Design Features. The principal features are illustrated on the plan, profile and cross-section plates enclosed in Appendix E. Information has been obtained from the documents listed above and from measurements taken during the field inspection. A summary of the pertinent design features is included in Section 1.3.

2.2 Construction.

There is no data available concerning the construction history of this dam and reservoir.

2.3 Operational Data.

No water levels are maintained by the water company. However, rainfall records are maintained at a reporting rainfall station within the area of the other three reservoirs owned by the Mahanoy Township Water Company.

2.4 Evaluation.

a. Availability. All information presented herein was extracted from records located in the Department of Environmental Resources (DER) files in Harrisburg, Pennsylvania, from conversations with the Owner's representative and from the limited resources of the Mahanoy Township Water Authority.

b. Adequacy. Available data included in the State files and presented in this report were not adequate to evaluate the engineering aspects of this dam.

c. Validity. There is no reason to question the validity of the limited available data.

SECTION 3 VISUAL INSPECTION

3.1 Findings.

a. General. Observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix B, and are summarized and evaluated in the following sections. In general, the appearance of the facility indicates that the dam is currently in poor condition.

b. Dam. The vertical alignment of the dam crest was checked and the profile is shown on Plate 4, Appendix E. The embankment is 0.4 feet below the left spillway wall and there is approximately seven inches of freeboard at normal pool. There was no discernible horizontal displacement or bulging noted along the crest, but slope undulations were prevalent along the full length of the dam. Longitudinal surface cracks were noted principally on the upstream side of the crest as shown on Sheet 5a and in Appendix D. These cracks appear to be surface cracks with no evidence found of embankment movement associated with them. Several small elliptical slope movements were noted near the toe, which appear to be scars from old shallow surface slides. Minor erosion was noted along the crest and at a few locations along the slope. One depressed area on the crest, as shown on Sheet 5a, appears to have resulted from concentrated surface runoff passing over the downstream slope.

There were no riprap failures observed and junctions between the embankment and abutments are in reasonably good condition. Clear seepage was noted along the downstream toe and beneath the main discharge pipe at the low section of the embankment, as shown on sheet 5a.

c. Appurtenant Structures.

1. Spillway. The concrete discharge spillway and walls are assessed to be in fair condition with some cracking and spalling. The left headwall of the spillway has cracked and separated from the channel wall, rotating upstream. This section of wall is in poor condition. Railroad track has been installed in an attempt to restrain further movement. See Photograph 9. The channel immediately downstream of the spillway has been severely eroded; see Photograph 10 and Plate 5. The channel is only partially protected by large boulders and rocks.

2. Outlet Works. The 10-inch outlet pipes are located through the embankment and the inlets were underwater. Only the outlet ends and valves could be inspected. In both cases, the outlet pipes appeared to be old, in fair condition, and the valves appeared in poor condition as they are poorly protected from the elements, rusty, and visually appear to be of marginal servcability.

d. Reservoir. The reservoir slopes are flat to moderate and well vegetated to the water's edge. There is no evidence of significant siltation, bank slope instability or other features that would significantly affect the flood storage capacity of the reservoir.

e. Downstream Channel. The downstream channel flows through a steep narrow valley to an abandoned railroad embankment 2,750 feet downstream of the dam. This embankment is estimated to be about 30± feet high, measured from the crest to the downstream toe. About 900 feet farther, Pole Run enters North Mahanoy Creek near Shoemakers, Pennsylvania.

There are two homes adjacent to Pole Run and several more in Shoemakers, subject to damage and probable loss of life in the event of abrupt failure during a severe storm.

The severity of damage during an extreme event or failure of Pole Run Dam depends on whether or not the high (30± foot) railroad embankment also failed. It is reported that water ponded behind the railroad embankment during Tropical Storm Agnes. It is conservatively assumed that the embankment would fail during storms greater than Agnes or if overtopped. Inspection of the railroad embankment was not possible. Although permission was granted for access to the embankment, no one was available to control the watchdogs.

3.2 Evaluation.

In summary, visual inspection of the dam disclosed no evidence of incipient failure. The longitudinal cracks observed along the crest and signs of seepage through the embankment are considered undesirable features. Long-term creep and distortion of the downstream slope indicate that the stability of the structure may be marginal and that additional investigations and evaluations should be performed, as described in Section 7. Hydrologic and hydraulic evaluations are discussed in Section 5.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Procedures.

Normal procedures do not require a dam tender. Water is discharged through the 10-inch pipes only when the first three reservoirs owned by Mahanoy City Water Authority become low and supplemental water supply is needed.

4.2 Maintenance of the Dam.

There is very little evidence of routine maintenance of this structure other than removal of woody vegetation from the downstream slope.

4.3 Maintenance of Operating Facilities.

Similar to dam maintenance, there is very little evidence that operating facilities have been maintained by the water company. There is no evidence that the valves have ever been lubricated.

4.4 Warning Systems In Effect.

There are no formal warning systems or procedures established to be followed during periods of exceedingly heavy rainfall.

4.5 Evaluation.

There are no written operating procedures, maintenance procedures or warning systems. If the dam were to fail, the downstream railroad embankment is assumed to fail, extensive property damage and probable loss of life would be expected at Shoemakers, Pennsylvania. Since the dam is classified as a "High" hazard dam, maintenance and operating procedures should be developed and implemented. These procedures should include a checklist of items to be observed, operated and inspected on a regular basis.

Since a formal warning procedure does not exist, a formal procedure should be developed to notify downstream residents and implemented during periods of exceedingly heavy rainfall. This procedure should include a detailed method of monitoring the dam and railroad embankment during severe storms. However, access to the dam during periods of high flow may not be possible as the road to the structure is unpaved and crosses the discharge channel of Mahanoy Township Water Authority's Dam No. 2.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design/Evaluation Data. There is no design/evaluation data for the existing spillway. Hydrologic and hydraulic evaluations made as a part of this investigation are contained in Appendix C.

The watershed is a small, mountain-top watershed approximately one mile long and about 0.7 miles wide, having a total area of 0.58 square miles. Elevations range from a high of 1,912 to normal pool elevation of 1,711. The watershed is completely wooded with no residential development. The Water Authority owns most, if not all, of the watershed. The runoff characteristics of the watershed are not likely to change.

In accordance with the criteria established by the Federal (OCE) Guidelines, the recommended spillway design flood for this "Small" size dam and "High" hazard potential classification is 0.5 to 1.0 PMF (Probable Maximum Flood).

b. Experience Data. No reservoir level records are maintained. No estimate was available of previous high reservoir elevations. Mahanoy Township Water Authority maintains a reporting rain gauging station within one mile of the dam. A frequent storm of record for this part of the State occurred June 1972, Tropical Storm Agnes. Consecutive 24-hour rainfalls reported at Reservoir No. 1 are 3.57 and 5.10 inches. The 5.10 inches could represent 17 to 19 percent of the PMF; see Appendix C.

c. Visual Observations. The only condition disclosed by the inspection that limits spillway capacity is the very small distance between the reservoir surface and the top of the dam, as shown on Plate 4, Appendix E. Other observations regarding the condition of the downstream channel, spillway and reservoir are located in Appendix B.

d. Overtopping Potential. The overtopping potential of this dam was estimated using "HEC-1, Dam Safety Version", computer program. A brief description of the program is included in Appendix C. Calculations indicate that the maximum spillway capacity is about 60 cfs when the reservoir level is at the minimum crest elevation. The HEC-1 computed peak PMF inflow is 1,484 cfs. The spillway passes less than 10 percent of the PMF without overtopping the dam. The spillway could pass about 0.22 PMF if the minimum crest elevation was at the top of the spillway wall.

e. Spillway Adequacy. The spillway is rated as "Seriously Inadequate" as all of the following criteria are met:

1. The spillway will not pass 50 percent of the PMF without overtopping the dam.
2. Overtopping will cause dam failure.
3. There will be a significant increase in property damage and potential for loss of life as a result of failure by overtopping.

As discussed in this report, the embankment materials and quality of construction are unknown. Although the embankment has probably been overtopped in the past, the depth and duration of flow is unknown. In this report, the embankment is conservatively assessed to fail if overtopped by 0.5 foot or for several hours. The increase in hazard is discussed in the following paragraph.

f. Downstream Condition. It is reported during Tropical Storm Agnes, that discharge from the dam ponded water behind the abandoned railroad embankment about 2,750 feet downstream of the dam. Residents immediately downstream of the railroad embankment left their homes fearing failure of the railroad embankment. It is conservatively assumed that the railroad embankment would fail during storms greater than Agnes, if overtopped or if Pole Run No. 4 Dam failed. Failure of the dam and railroad embankment will release more water than failure of the dam alone. Damage downstream will be significantly greater as a result of failure during an extreme event than damage resulting from high flows without failure.

SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. Visual observations did not indicate an immediate embankment stability problem, but there is evidence of long-term downstream slope movements and longitudinal cracking along the crest. It is noted that this cracking may be attributed to the high water level with respect to the top of the embankment and recent freeze-thaw cycles which promote cracking.

In its present state, the dam is considered to be in a noncritical unsafe condition. The evidence for this classification includes slope distortions, longitudinal cracks, and general steepness of the slope. As noted in Section 3, clear seepage was observed through the embankment toe and beneath the discharge pipes, but is probably a result of high phreatic surface and possibly an embankment without a suitable drainage system.

The concrete spillway is considered to be in fair condition, but the upstream wing wall is in poor condition. The concrete in several places is spalled and cracked and the upstream left retaining wall has cracked and has rotated upstream away from the channel side wall. The discharge channel below the spillway is in poor condition. Continued deterioration of the channel would most likely lead to undermining and possible failure of the spillway.

b. Design and Construction Data. No design or construction data is known to exist. All data concerning physical features are limited to physical dimensions of the dam taken during the field inspection and are, therefore, inadequate for a detailed evaluation of the structure.

c. Operating Procedures. No operating procedures currently exist.

d. Post-Construction Changes. Since completion in 1887, and the "Report Upon the Pole Run Dam No. 4 of the Mahanoy City Water Company", there have been no changes to this dam except for reconstruction of the spillway.

e. Embankment Stability. There were no embankment stability evaluations located in the files. Visual inspection revealed some slope movement, as evidenced by undulations, both laterally and vertically. The slopes are also steep and

clear seepage was noted through the toe at several places. Therefore, a stability analysis is warranted.

f. Seismic Stability. The dam is located in Seismic Zone 1. Normally it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake conditions. Since the static factor of safety for this dam is unknown, a seismic stability evaluation could not be made. Considering the condition of the slopes covered with vegetation and signs of long-term creep movement, it is concluded that a static stability analysis should be performed and, based on this, the seismic stability evaluated.

SECTION 7
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. On the basis of the visual inspection, the dam is judged to be in generally poor condition and should be considered unsafe. There are no engineering or construction data other than meager information obtained from the field, DER files and conversations with the water company. Downstream and upstream slopes are irregular, showing signs of long-term movement. The pond drain and outlet systems for water supply are considered "marginal" and their servicability is questionable. The spillway is considered to be in fair condition, but the discharge channel is in poor condition and in need of repair and general rehabilitation to prevent undermining of the concrete spillway. The upstream embankment affords very little freeboard even during normal storage. Therefore, overtopping is likely during severe storms.

b. Adequacy of Information. Insufficient engineering and construction data were found to adequately evaluate the stability of the dam. Specifically, no plans or specifications were reportedly prepared. There was no evidence found of an embankment drainage system. Foundation preparation details are also unknown. It is not known if there is a cutoff trench or core wall or grout curtain, and a 1914 report indicates that probably none of these features were included in construction of the dam.

c. Urgency. It is concluded that recommendations considered critical in Section 7.2 be implemented immediately. All other items should be implemented as soon as practical.

d. Necessity of Additional Studies. It is judged that additional investigations pertaining to embankment stability and hydraulics should be performed. These recommendations are described in Section 7.2.

7.2 Remedial Measures.

a. Facilities. The following recommended remedial work is considered to be critical and should be performed immediately under the direction of a registered professional engineer experienced in dam design.

1. A geotechnical investigation should be performed. This investigation should include test borings,

retrieval of undisturbed samples and installation of piezometers or well points. Based on an evaluation of the results, a stability analysis should be performed.

2. The spillway system should be reconstructed to meet current hydrologic/hydraulic criteria as determined from a detailed hydrologic/hydraulic analysis.
3. Seepage along the downstream slope and beyond the toe of the dam should be collected and monitored for turbidity and changes in rates of seepage. Remedial measures should be taken if deemed appropriate after an analysis by the engineer.

The following items are considered important and should be performed as soon as practical.

1. Trees and other vegetation on the slopes should be removed.
2. The outlet works should be inspected and repaired to a serviceable condition.
3. The pond drains should have provisions for emergency upstream closure.

b. Operation and Maintenance Procedures. A formal maintenance and warning procedure should be developed and implemented for this facility. The Owner should also develop an inspection checklist as an amendment to the maintenance procedure to insure that all critical items are periodically inspected and maintained. The warning procedure should include provisions for monitoring the structure during periods of exceedingly heavy rainfall and a method of warning downstream residents that high flows are expected. Evacuation procedures should also be developed.

APPENDIX

A

NAME OF DAM Pole Run Dam No. 4
ID # PA 00686

Sheet 1 of 4

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

REMARKS

ITEM

AS-BUILT DRAWINGS

None available.

REGIONAL VICINITY MAP

See Plate 1, Appendix E.

CONSTRUCTION HISTORY

No significant information is available.

TYPICAL SECTIONS OF DAM

See Appendix E.

OUTLETS - PLAN

DETAILS

CONSTRAINTS

DISCHARGE RATINGS

RAINFALL/RESERVOIR RECORDS

See Appendix E.

- Not available.

- None available.

ITEM	REMARKS
DESIGN REPORTS	<i>None available.</i>
GEOLOGY REPORTS	<i>None available. See Appendix F for data collected for this 1979 inspection report.</i>
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	<div data-bbox="779 1218 885 1249" data-label="Text"> <p>{ }</p> </div> <i>See Appendix C. Not available.</i>
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	<div data-bbox="1015 1281 1120 1302" data-label="Text"> <p>}</p> </div> <i>Not available.</i>
POST-CONSTRUCTION SURVEYS OF DAM	<i>None.</i>
BORROW SOURCES	<i>Unknown.</i>

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	None - except rehabilitation of spillway in early 1970's.
HIGH POOL RECORDS	None.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None.
MAINTENANCE OPERATION RECORDS	None.

ITEM	REMARKS
------	---------

SPILLWAY PLAN

SECTIONS

DETAILS

See Appendix E.

OPERATING EQUIPMENT
PLANS & DETAILS

Not available.

MISCELLANEOUS

1. "Report Upon the Pole Run Dam No. 4 of the Mahanoy City Water Company", 4 December 1914.
2. Inspection Reports from 1948 through 1971.

APPENDIX

B

CHECK LIST
VISUAL INSPECTION
PHASE I

Sheet 1 of 11

Name Dam Pole Run Dam No. 4 County Schuylkill State Pennsylvania National ID # PA 00686
Type of Dam Earth Hazard Category I-High
Date(s) Inspection 10 April 1979 Weather Partly cloudy, breezy Temperature 40's

Pool Elevation at Time of Inspection 1710.8 M.S.L. Tailwater at Time of Inspection N/A M.S.L.

Inspection Personnel:

John Boschuk, Jr. (Geotechnical) Mary F. Beck (Hydrologist) John H. Frederick (Geotechnical)
Vincent McKeever (Hydraulic) Raymond Lambert (Geologist)
John Boschuk, Jr. Recorder

Remarks:

Mr. George Palmer, Manager, accompanied the inspection team to the site.

CONCRETE/MASONRY DAMS

Sheet 2 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	N/A	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A	

CONCRETE/MASONRY DAMS

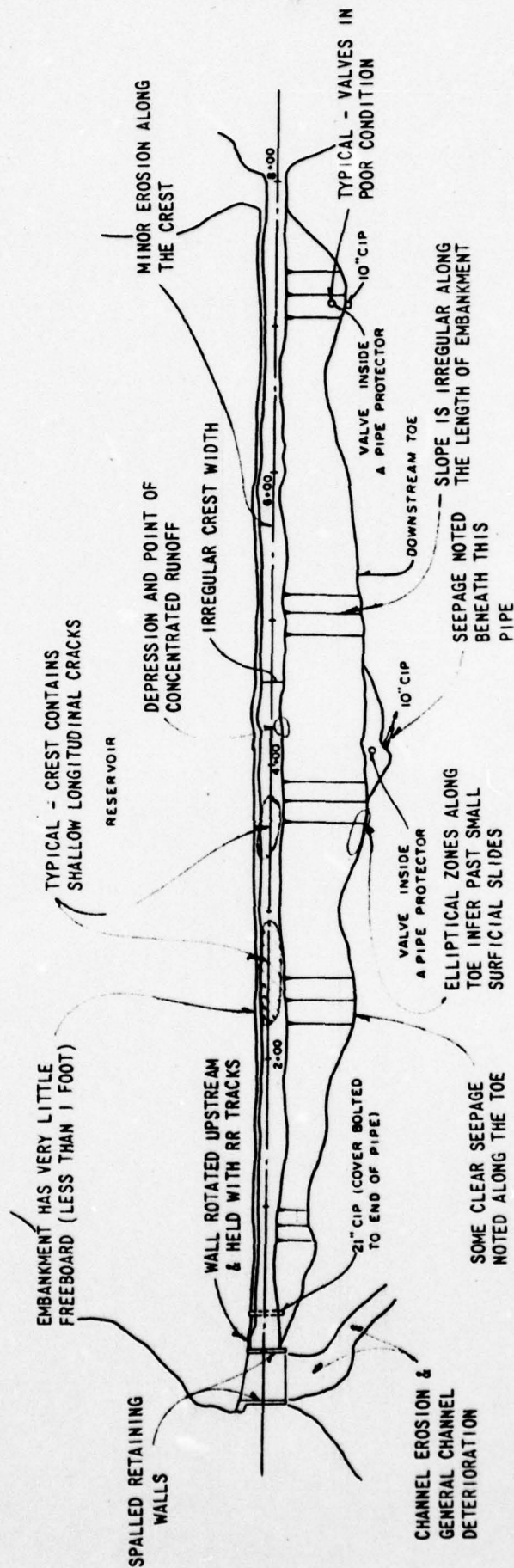
Sheet 3 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	

EMBANKMENT

Sheet 4 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	<p>Yes. Horizontal surface cracks were noted mostly on the upstream side of the crest as shown on Sheet 5a, and in Appendix D. They appear to be surface cracks and there was no evidence found of embankment movement associated with these cracks.</p>	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	<p>None observed but several small elliptical areas along the downstream toe were observed which appear to be scars of old shallow surface slides.</p>	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	<p>Minor erosion was noted along the crest and at a few locations along the slope. One depressed area as shown on Sheet 5a, appears to be a place where surface runoff concentrates before passing over the downstream slope.</p>	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	<p>Horizontal alignment appears to be good with no significant deviation when compared to old photographs. The vertical alignment undulates as shown on Plate 4, Appendix E.</p>	
RIPRAP FAILURES	<p>None observed.</p>	



0 30
SCALE IN FEET

FIELD OBSERVATION PLAN
POLE RUN DAM NO. 4

SHEET 5A OF 11

EMBANKMENT

Sheet 5 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Junctions are in reasonably good condition but the embankment is 0.4 feet below the left spillway wall.	
ANY NOTICEABLE SEEPAGE	Yes. See sheet 5a. All seepage was observed to be clear.	
STAFF GAGE AND RECORDER	None	
DRAINS	Unknown.	

OUTLET WORKS

Sheet 6 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Could not be observed.	
INTAKE STRUCTURE	Underwater.	
OUTLET STRUCTURE	Only the ends of the outlet pipes could be observed. They are in fair condition and the valves were assessed to be in poor condition as they are rusted and did not appear to be serviceable.	
OUTLET CHANNEL	None	
EMERGENCY GATE	None	

UNGATED SPILLWAY

Sheet 7 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
------------------------------	---------------------	-----------------------------------

CONCRETE WEIR	None - concrete channel sloping downstream.	
---------------	---	--

APPROACH CHANNEL	N/A	
------------------	-----	--

DISCHARGE CHANNEL	Poor condition. Significant portions of the channel have been eroded especially after Tropical Storm Agnes. There is an approximately 4-1/2 foot drop at the downstream edge of the discharge channel. See Plate 5, Appendix E.	
-------------------	---	--

BRIDGE AND PIERS	None	
------------------	------	--

GATED SPILLWAY

Sheet 8 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

INSTRUMENTATION

Sheet 9 of 11

<u>VISUAL EXAMINATION</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

RESERVOIR

Sheet 10 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
------------------------------	---------------------	-----------------------------------

SLOPES

Reservoir side slopes are moderate, well vegetated with trees to water's edge.

SEDIMENTATION

Minimal sedimentation, no effect on flood storage.

DOWNSTREAM CHANNEL

Sheet 11 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	<i>There are no obstructions for about 2750 feet below the dam where the channel passes under an abandoned railroad embankment. During large storms, water ponds behind this embankment.</i>	
SLOPES	<i>Valley gradient is approximately 0.08 through a wooded, steep mountain valley.</i>	
APPROXIMATE NO. OF HOMES AND POPULATION	<i>About 3000 feet below the dam are two homes, about 500 feet further, Pole Run enters Mahanoy Creek where several houses are built adjacent to the stream. They have been flooded in the past.</i>	

APPENDIX

C

POLE RUN DAM NO. 4
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: All wooded, no residential development.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1711 feet* (106 Acre-Feet).

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1711.7 feet (115 Acre Feet)

ELEVATION MAXIMUM DESIGN POOL: -----

ELEVATION TOP DAM: 1711.7 feet minimum crest elevation.

SPILLWAY

a. Elevation 1711.00.

b. Type Concrete chute.

c. Width Upstream edge, 31'5", downstream, 26'9".

d. Length 25'6" to 33'3".

e. Location Spillover Right abutment.

f. Number and Type of Gates None.

OUTLET WORKS:

a. Type Two 10-inch cast iron pipe.

b. Location Near left end and one below original ground at maximum section of dam.

c. Entrance inverts Unknown.

d. Exit inverts -----

e. Emergency draindown facilities The lower 10-inch pipe.

HYDROMETEOROLOGICAL GAGES:

a. Type Standard Rain Gage.

b. Location At Reservoir No. 1, less than 1 mile from this dam.

c. Records A reporting Weather Service Station.

MAXIMUM NON-DAMAGING DISCHARGE: -----

* All elevations are based on spillway elevation of 1711 feet as shown on USGS Map.

HEC-1, REVISED
FLOOD HYDROGRAPH PACKAGE

The original "Flood Hydrograph Package" (HEC-1), developed by the Hydrologic Engineering Center, Corps of Engineers, has been modified for use under the National Dam Inspection Program. The "Flood Hydrograph Package (HEC-1), Dam Safety Version", hereinafter referred to as, HEC-1, Rev., has been modified to require less detailed input and to include a dam breach analysis. The required input is obtained from the field inspection of a dam, any available design/evaluation data, relatively simple hydraulic calculations, or information from the USGS Quandrangle maps. The input format is flexible in order to reflect any unique characteristics of an individual dam.

HEC-1, Rev. computes a reservoir inflow hydrograph based on individual watershed characteristics such as: area, percentage of impervious surface area, watershed shape, and hydrograph characteristics determined from regional correlation studies by the Corps of Engineers, Baltimore District. The inflow is routed through the reservoir using spillway discharge data obtained from the field inspection or design data. Flood storage capacity is determined from USGS maps or design information and verified by the field inspection. In the event a spillway cannot discharge 0.5 PMF without overtopping and failure of the dam, downstream channel characteristics obtained from the field inspection and USGS maps are inputted and flows are routed downstream to the damage center and a dam breach analysis is performed.

Included in this Appendix are the HEC-1, Rev. pertinent input values and a summary print-out tables.

BY MFB DATE 5/3/79

SUBJECT

SHEET 3 OF 10

CHKD. BY JF DATE 5/3/79

Pole Run Dam No. 4

JOB No.

Hydrology / Hydraulics

Classification (Ref. Recommended Guidelines for Safety Inspection of Dams)

1. The hazard classification is "High" as failure would result in the loss of life.
2. The size classification is "Small" based on its 30 ± ft. height and 11.5 Ac-Ft total storage capacity.
3. The spillway design flood, based on size and hazard classification, is 0.5 to 1.0 PMF (Probable Maximum Flood).

Hydrology and Hydraulic Analysis

1. There was no design or evaluation data for the existing spillway.
2. Evaluation of structure was by use of the computer program. Computer input data as follows:

Inflow hydrograph

rainfall ref. Hydrometeorological Report No. 40. (on sheet 6)
drainage area, determined from USGS Maps is
0.58 sq. miles.

Snyder's hydrograph parameters, $t_p \neq C_p$

$$t_p = C_p (L \cdot A_{ca})^{0.3}$$

$C_p = 1.85$ } Information received from Corps of
 $C_p = 0.50$ } Engineers, Baltimore for Zone 19.

$L = 1.04$ miles } From USGS

$A_{ca} = 0.568$ miles } Maps

$$t_p = 1.85 (1.04 \cdot 0.568)^{0.3} = 1.58 \checkmark$$

Reservoir routing

elevation - storage, shown on sheet 7

normal storage volume reported by owner

flood storage taken from USGS Map

BY MFB DATE 5/2/79
CHKD. BY 7/7 DATE _____

SUBJECT _____
Pale Run Dam No. 4
Hydrology / Hydraulics

SHEET 4 OF 10
JOB No. _____

elevation-discharge, shown on sheet 7
assume critical depth over entrance to spillway
 $d_c = \frac{2}{3} H_e$ (specific energy) ($L = 31.5'$)

check normal depth in spillway to check $d_c > d_n$ by
Manning equation

$$Q = b \cdot d \cdot \frac{1.49}{n} \left(\frac{b \cdot d}{b + 2d} \right)^{2/3} S^{1/2}$$

$b = 28.7 \text{ ft @ } \frac{1}{2}$ } from field
 $S = 0.74' / 13' = 0.0569$ } survey
 $n = 0.015$ - for fair concrete

$d_n \leq d_c$ for all values of Q

crest profile from field survey entered

Overtopping potential - as shown on sheet 8, the dam is overtopped by 0.1 PMF. Sheet 9 indicates that about 0.22 PMF could be discharged if the minimum embankment elevation was at the top of spillway wall at dam centerline.

An assumed failure shape and time is shown on sheet 10. No downstream routing is included because no information is available on railroad embankment, which is assumed to fail.

Weather Service Publications indicate consecutive 24-hour rainfalls (recorded less than 1 mile from the dam) during June 1972 (Tropical Storm Agnes) of 0.12, 3.57, 5.10 and 0.28 inches. The 5.10 inches represents about 0.17 PMF. If the 5.10 inches is assumed to have fallen within 6 hours, it would represent 0.19 PMF.

Spillway adequacy - the spillway is rated as "seriously inadequate" as the following criteria is satisfied:

1. The dam will not pass 0.5 PMF w/o overtopping.
2. The dam will fail as a result of overtopping.
3. The failure will significantly increase the hazard to loss of life downstream.

ref. - ETL No. 1110-2-234, 10 May 1970.

MFB

5/3/79

Pole Run Dam No. 4
Hydrology / Hydraulics

SH 5 OF 10

 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 26 FEB 79

RUN DATE* 79/05/03.
 TIME* 06.31.24.

POLE RUN DAM NO. 4
 OVERTOPPING ANALYSIS
 MAT ID NO. PA 00686 DER NO. 54-36

JOB SPECIFICATION									
NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	20	0	0	0	0	0	-4	0
			JOPER	NUT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
 MPLAN= 1 NRTIO= 6 LRTIO= 1
 RTIOS= .10 .20 .30 .50 .80 1.00

MF8

5/3/79

Pole Run Dam No. 4
Hydrology / Hydraulics

34. 6 of 10

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
IN	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

INYB	IUNG	TAREA	SNAP	TRSDA	TRSPC	RAT10	ISNOV	ISAME	LOCAL
1	1	.58	0.00	.58	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.40	117.00	127.00	136.00	143.00	145.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STKR	DLTKR	RTIOL	ESAIN	SIRKS	RTIOL	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 1.58 CP= .50 NTA= 0

RECESSION DATA

STATO= -1.50 BRCSN= -.05 RTIOR= 1.00

UNIT HYDROGRAPH 38 END-OF-PERIOD ORIGINATES, LAG= 1.59 HOURS, CP= .50 VOL= 1.00									
10.	36.	72.	102.	117.	112.	96.	82.	71.	41.
52.	44.	38.	33.	28.	24.	21.	18.	15.	13.
11.	10.	8.	7.	6.	5.	4.	4.	3.	3.
2.	2.	2.	1.	1.	1.	1.	1.		

END-OF-PERIOD FLOW

NO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	NO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
							SUM	25.98	23.36	2.62			30755.
								(660.)	(593.)	(67.)			(870.88)

MFB 5/3/79

Pole Run Dam No. 4
Hydrology / Hydraulics

SH. 7 OF 10

HYDROGRAPH ROUTING

OUTFLOW HYDROGRAPH

STAGE	1711.00	1711.75	1712.50	1713.20	1714.00	1714.70	1715.50	1720.00	1723.00
FLOW	0.00	63.00	178.00	327.00	504.00	704.00	925.00	2620.00	4032.00
CAPACITY=	0.	106.	216.						
ELEVATION=	1683.	1711.	1720.						

ISTAQ	ICOMP	IECON	IIAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
OUT	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRIS	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1711.	-1

CREL	SPUID	COOU	EXPW	ELEV	COOL	CAREA	EXPL
1711.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMUID
1711.7	0.0	0.0	0.

CREST LENGTH AT OR BELOW ELEVATION	0.	240.	485.	810.
1711.7	1712.0	1713.0	1716.0	

MFB

5/3/79

Pole Run Dam No. 4
Hydrology / Hydraulics

SH. 8 OF 10

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS											
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6						
HYDROGRAPH AT	IN	.58	1	.10	.20	.30	.50	.80	1.00						
	(1.50)	(4.20)	(8.40)	(21.00)	(33.61)	(42.01)	(1484.	
ROUTED TO	OUT	.58	1	.10	.20	.30	.50	.80	1.00						
	(1.50)	(4.03)	(8.34)	(12.56)	(20.96)	(33.54)	(41.92)	(

SUMMARY OF DAM SAFETY ANALYSIS

RATIO OF PHF	MAXIMUM RESERVOIR U.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP : HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1711.99	.29	118.	142.	5.33	41.67	0.00
.20	1712.20	.50	121.	295.	8.33	41.33	0.00
.30	1712.34	.64	123.	444.	10.00	41.33	0.00
.50	1712.55	.85	125.	740.	12.00	41.33	0.00
.80	1712.78	1.08	128.	1185.	36.33	41.33	0.00
1.00	1712.91	1.21	130.	1480.	38.00	41.33	0.00

ELEVATION STORAGE	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
OUTFLOW	1711.00	1711.00	1711.70
	106.	106.	115.
	0.	0.	59.

5/3/79

Pole Run Dam No. 4
Hydrology / Hydraulics

SH. 9 OF 10

Reservoir routing assuming dam is not overtopped.
Note: Elevation of top of spillway wall at centerline of dam is 1713.09 ft.

SUMMARY OF DAM SAFETY ANALYSIS

RATIO OF PNF	ELEVATION STORAGE OUTFLOW	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM	TIME OF FAILURE HOURS
		1711.00	1711.00	1720.00 ✓	
		106.	106.	216.	
		0.	0.	2620.	
		MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS
		0.00	121.	128.	0.00
.10	1712.18	0.00	130.	270.	42.33
.20	1712.93	0.00	138.	410.	42.00
.30	1713.57	0.00	151.	699.	42.00
.50	1714.68	0.00	168.	1141.	41.67
.80	1716.07	0.00	178.	1432.	41.67
1.00	1716.84	0.00			41.67

Assumed breach dimensions

DAM BREACH DATA

BRUID	Z	ELBM	TFAIL	USEL	FAIEL
0.	.50	1685.00	4.00	1711.00	1712.20

RATIO OF PMF	MAXIMUM RESERVOIR U.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1711.99	.29 ✓	118.	142.	5.33	41.67	0.00
.20	1712.20	.50	121.	552.	4.08	43.17	41.33
.30	1712.30	.60	122.	744.	4.00	42.42	40.33
.50	1712.34	.64	123.	1142.	4.08	41.75	39.33
.80	1712.32	.62	122.	1605.	5.08	41.08	38.33
1.00	1712.35	.65	123.	1856.	6.50	40.92	38.00

ELEVATION STORAGE OUTFLOW	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	1711.00 ✓	1711.00 ✓	1711.70 ✓
	106.	106.	115.
	0.	0.	59.

APPENDIX

D



OUTLET PIPE AT DOWNSTREAM TOE. THREE
OF THESE PIPES WERE FOUND.

PHOTOGRAPH NO. 1



TYPICAL VALVE CONTROL MECHANISM ALONG
TOE TO CONTROL RESERVOIR DISCHARGE.

PHOTOGRAPH NO. 2



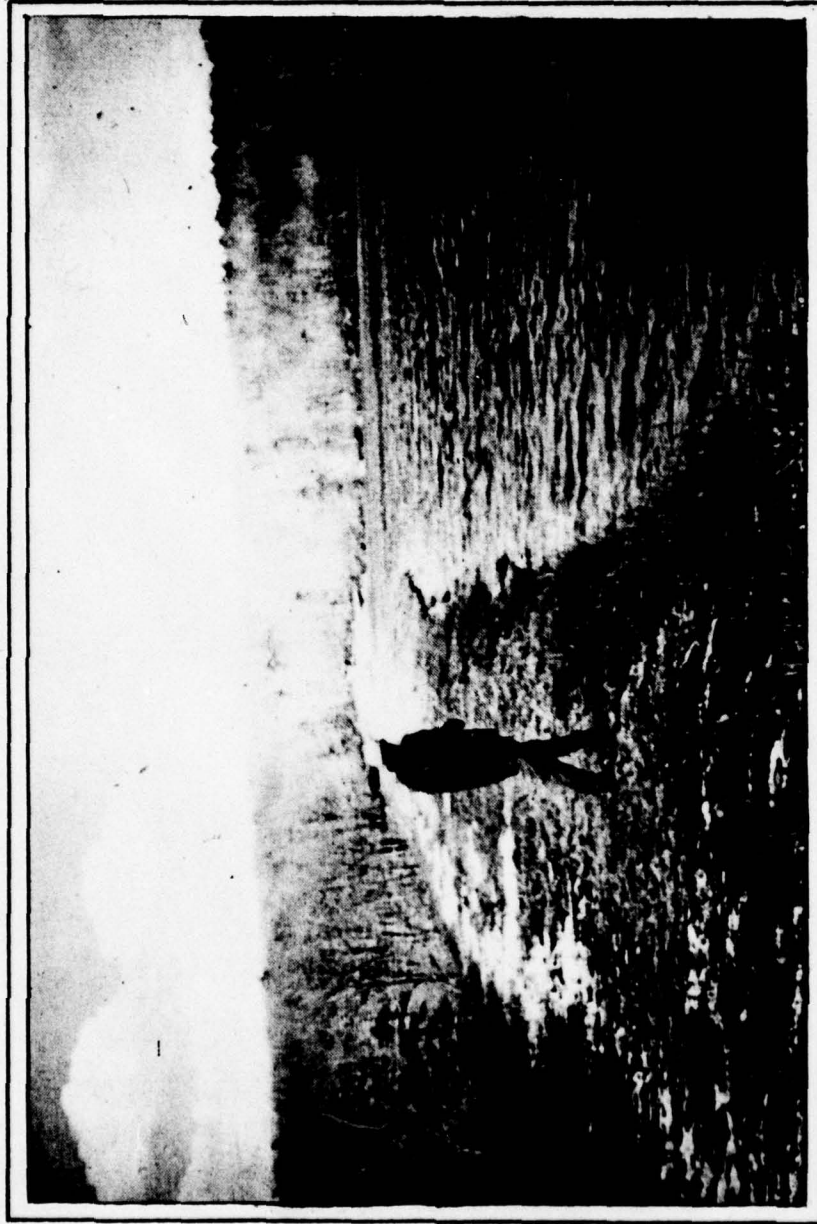
OVERVIEW OF EMERGENCY SPILLWAY.

PHOTOGRAPH NO. 3



EMERGENCY SPILLWAY DISCHARGE CHANNEL
JUST BELOW DAM.

PHOTOGRAPH NO. 4



TYPICAL VIEW OF UPSTREAM SLOPE LOOKING
FROM THE LEFT END OF THE DAM.

PHOTOGRAPH NO. 5



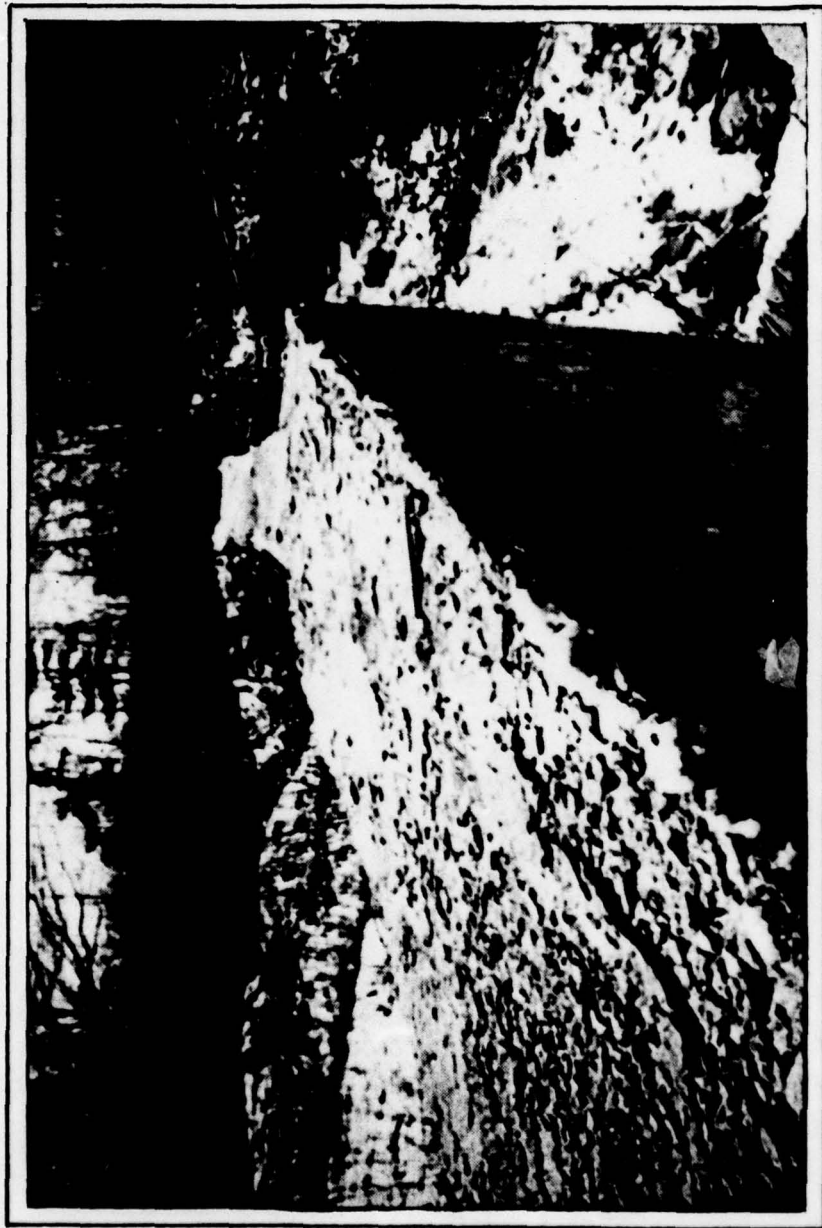
TYPICAL VIEW OF DOWNSTREAM SLOPE.

PHOTOGRAPH NO. 6



DETERIORATED SECTIONS OF CONCRETE
SPILLWAY WALLS

PHOTOGRAPH NO. 7



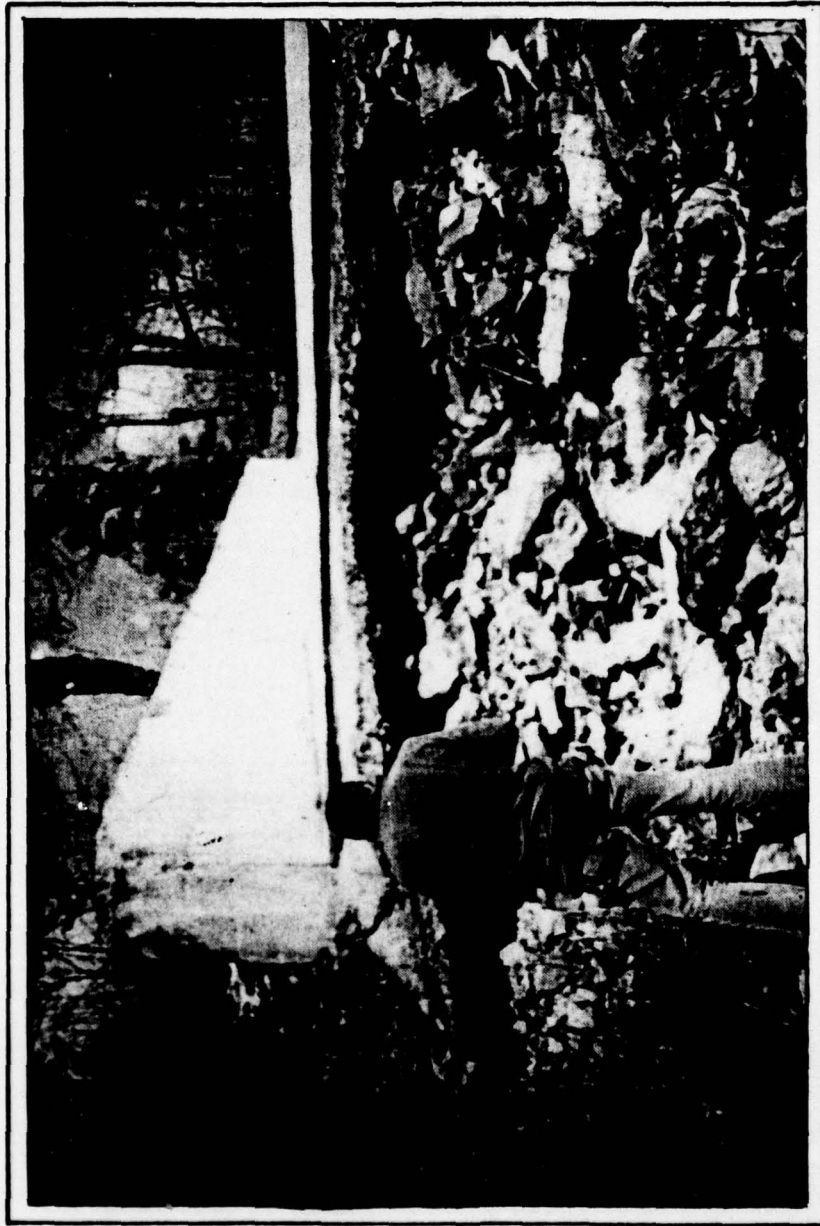
ALTERNATE VIEW OF DETERIORATED
SPILLWAY WALL.

PHOTOGRAPH NO. 8



DISPLACED UPSTREAM WINGWALL OF
EMERGENCY SPILLWAY.

PHOTOGRAPH NO. 9



DETERIORATED SPILLWAY DISCHARGE
CHANNEL. MOST DAMAGE REPORTEDLY
OCCURRED DURING TROPICAL STORM
AGNES.



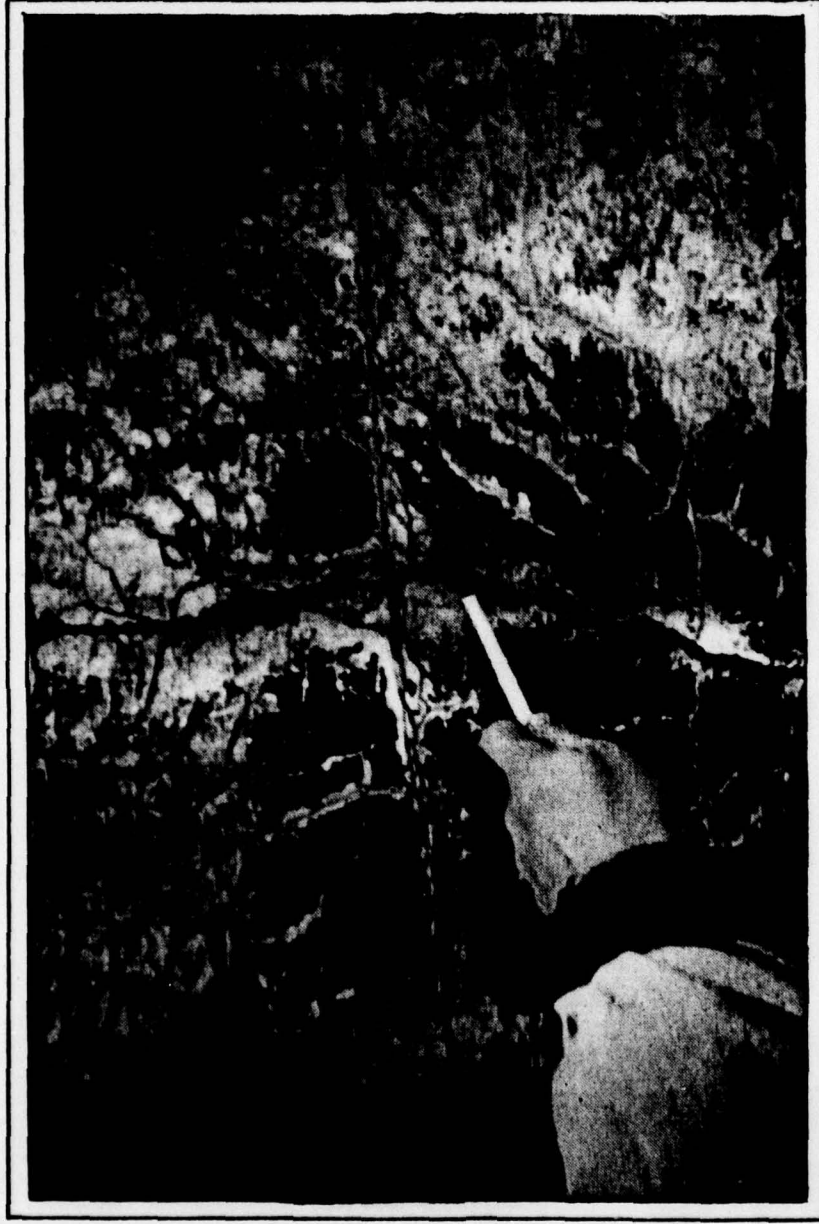
VIEW OF DEPRESSION ALONG CREST OF
DAM. LOCATION IS SHOWN ON SHEET
5a, APPENDIX B.

PHOTOGRAPH NO. 11



TYPICAL LONGITUDINAL SURFACE
CRACK ALONG CREST OF DAM.

PHOTOGRAPH NO. 12

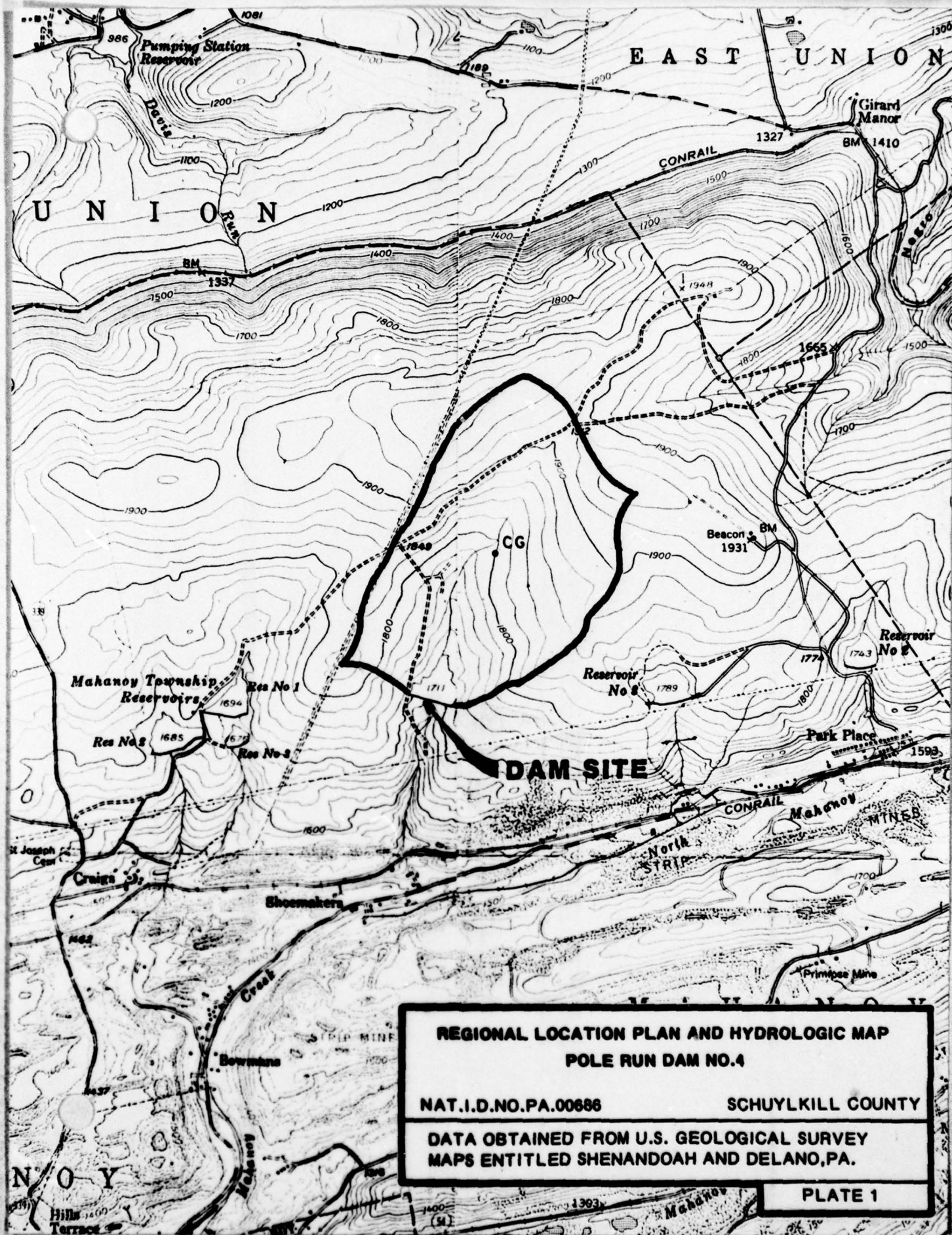


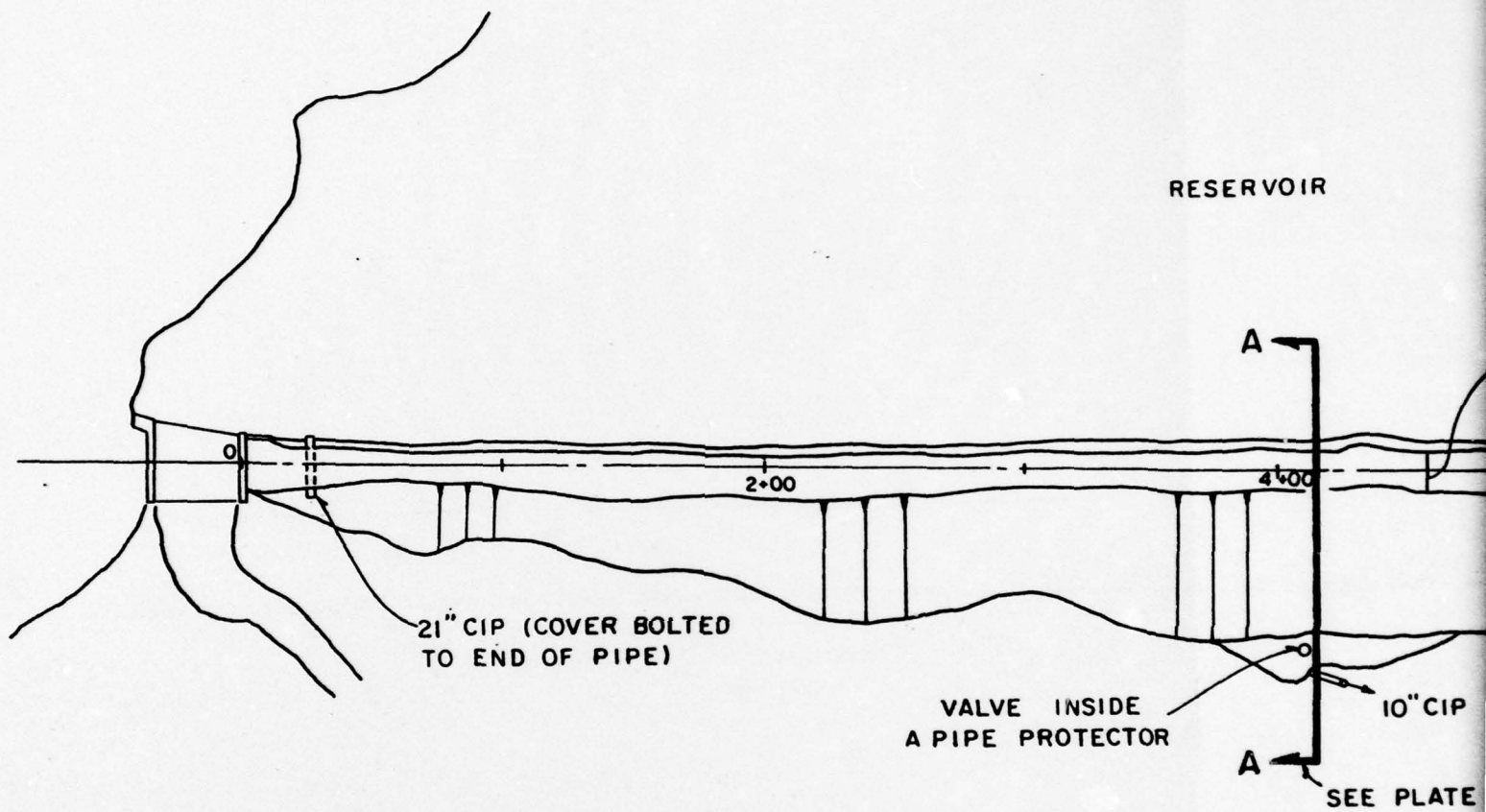
TYPICAL CRACKING OF SPILLWAY WALLS.

PHOTOGRAPH NO. 13

APPENDIX

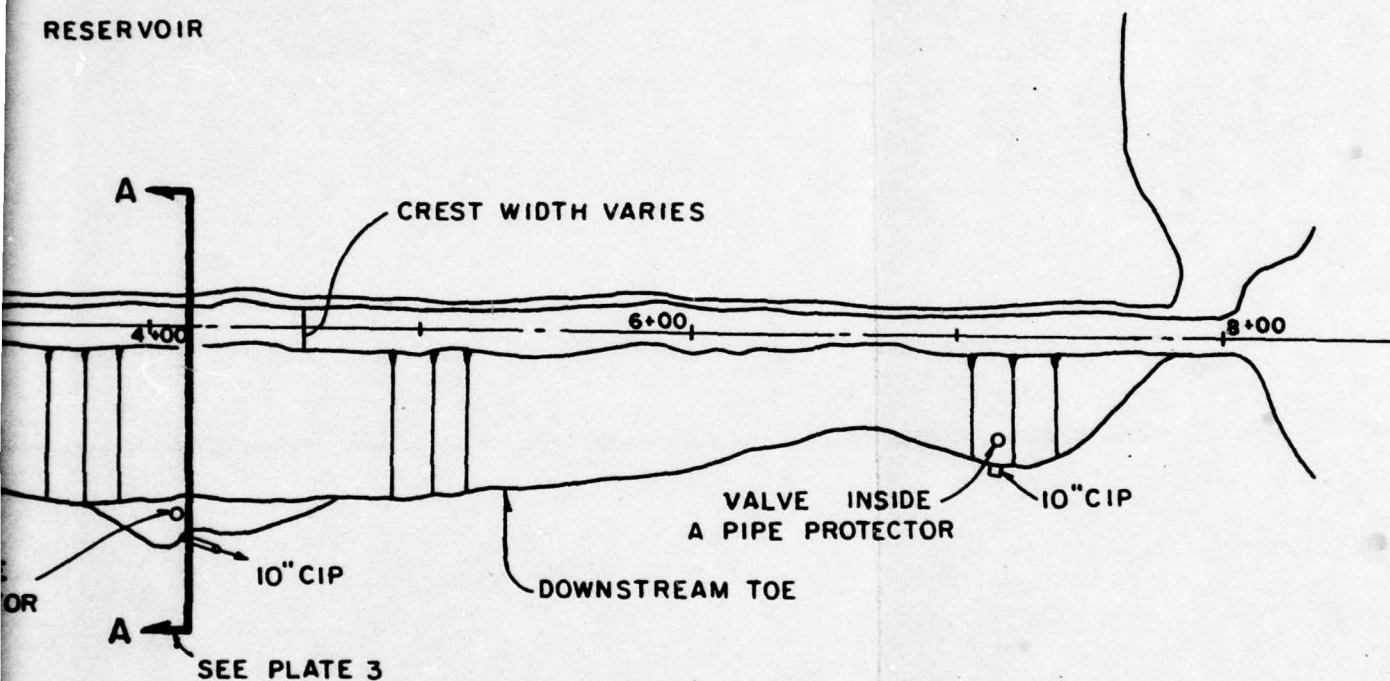
E





0 50
SCALE IN FEET

RESERVOIR



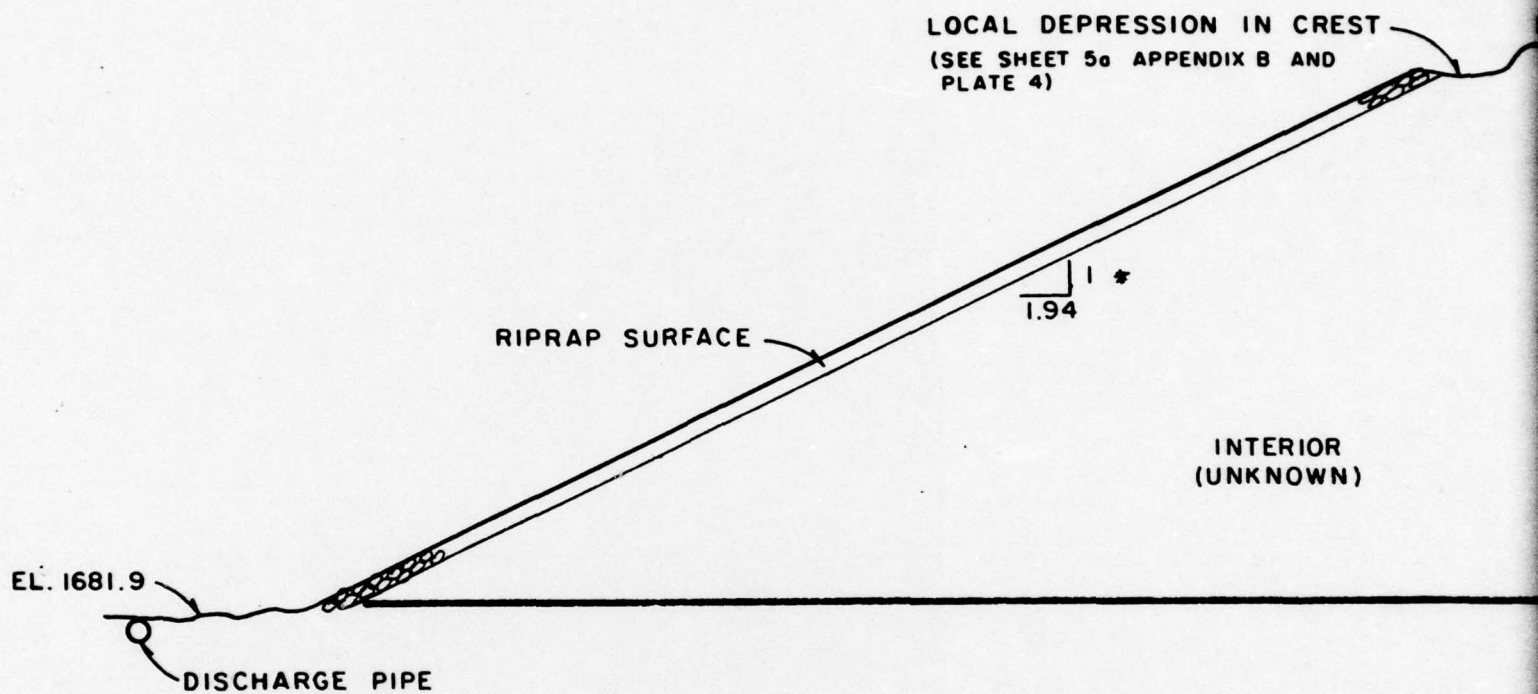
**PLAN OF DAM AND APPURTENANCES
POLE RUN DAM NO. 4**

NAT. I.D. NO. PA. 00886

SCHUYLKILL COUNTY

DATA OBTAINED FROM FIELD SURVEY, 10 APRIL, 1979

PLATE 2



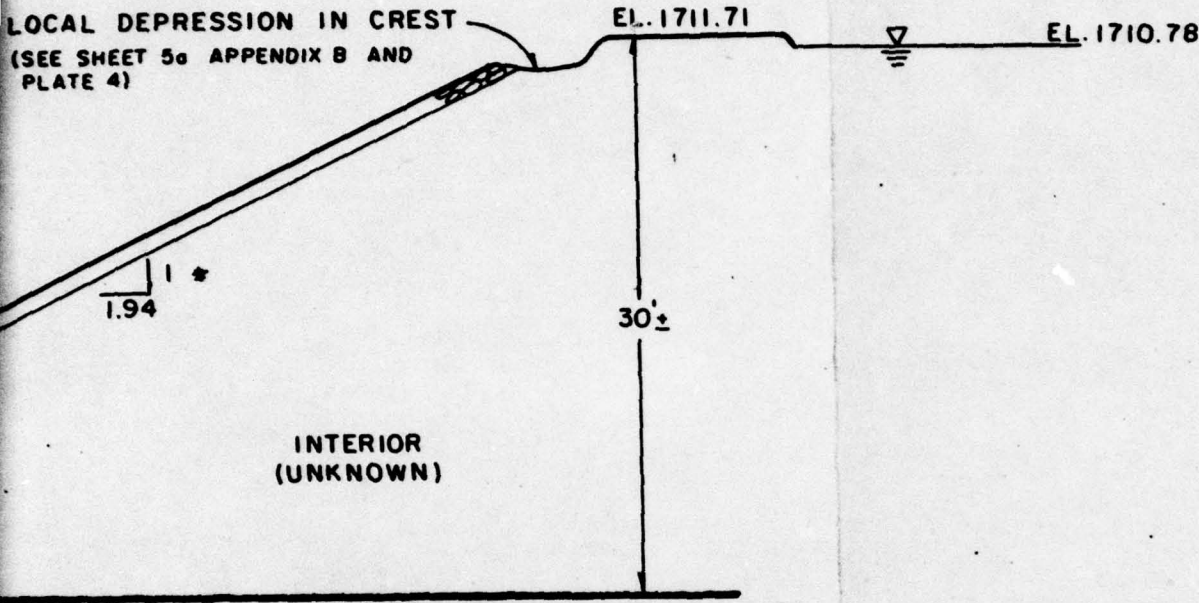
STATION 4 + 15

SECTION A-A

* NOTE : AVERAGE DOWNSTREAM SLOPE
IS APPROXIMATELY 2H : 1V



LOCAL DEPRESSION IN CREST
(SEE SHEET 5a APPENDIX B AND
PLATE 4)

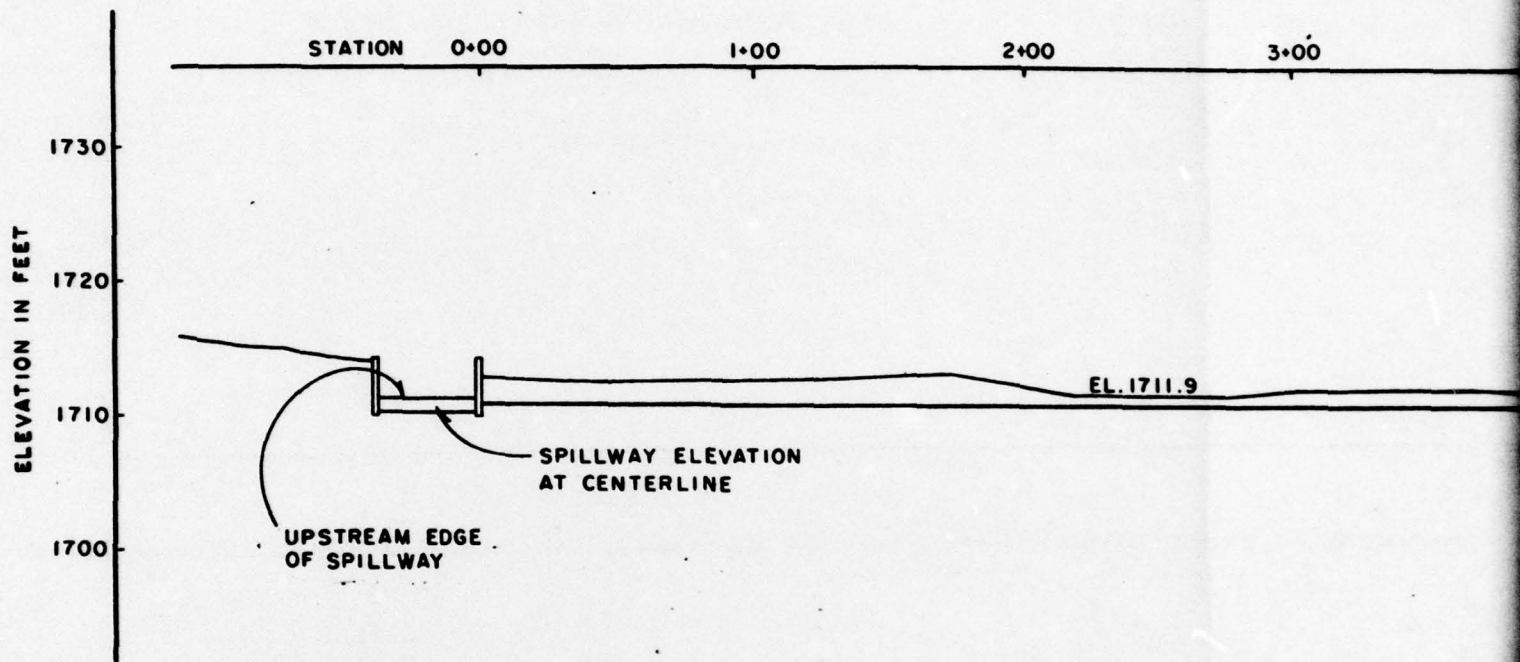


STATION 4+15

SECTION A-A

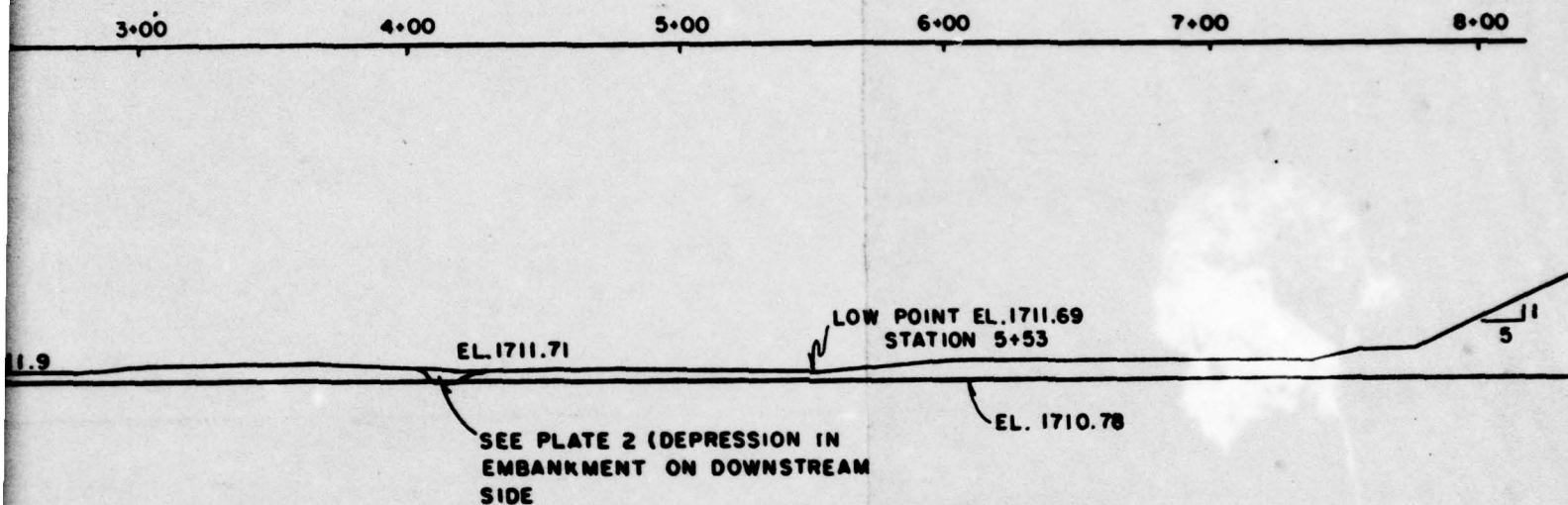


EMBANKMENT PROFILE	
POLE RUN DAM NO.4	
NAT.I.D.NO.PA.00886	SCHUYLKILL COUNTY
DATA OBTAINED FROM FIELD SURVEY, 10 APRIL, 1979	
PLATE 3	



0 50

SCALE IN FEET



**LONGITUDINAL PROFILE OF CREST
POLE RUN DAM NO. 4**

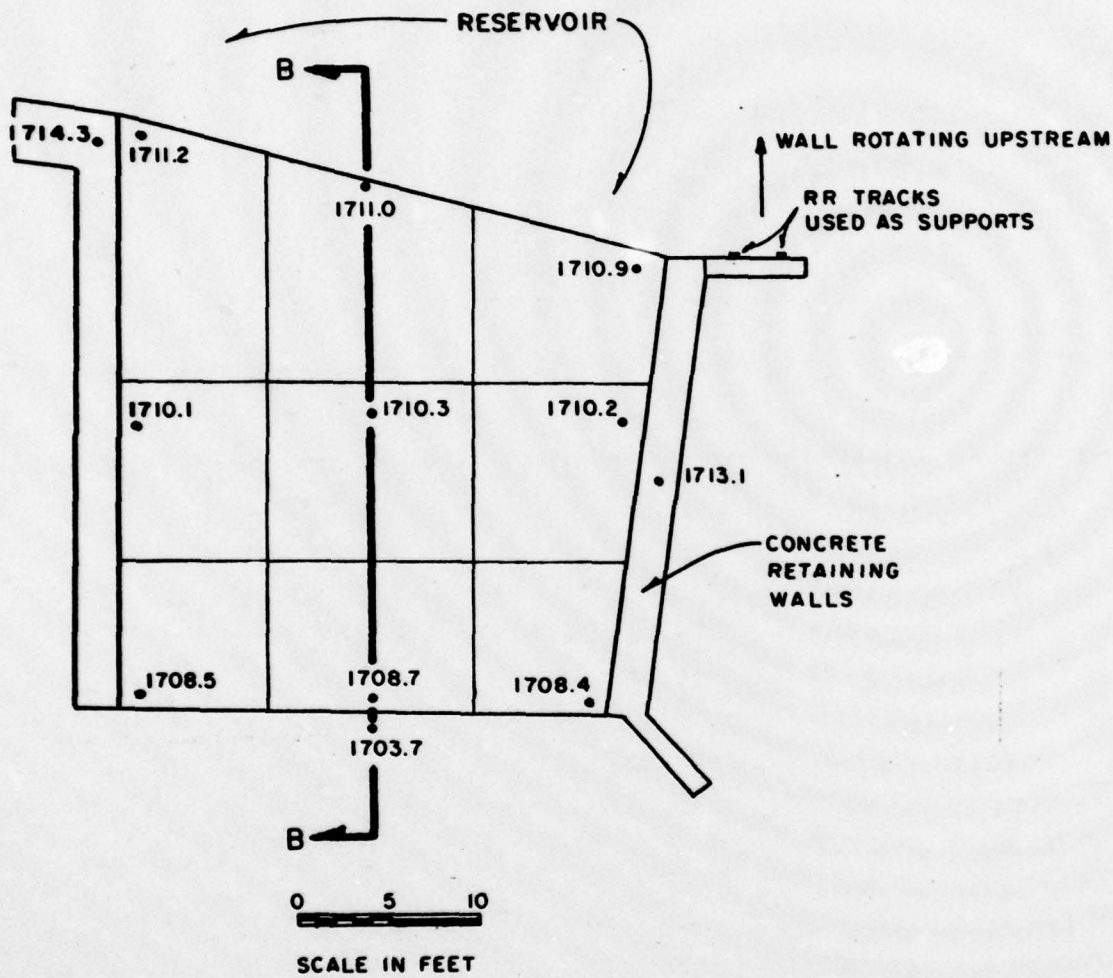
NAT. I.D. NO. PA. 00686

SCHUYLKILL COUNTY

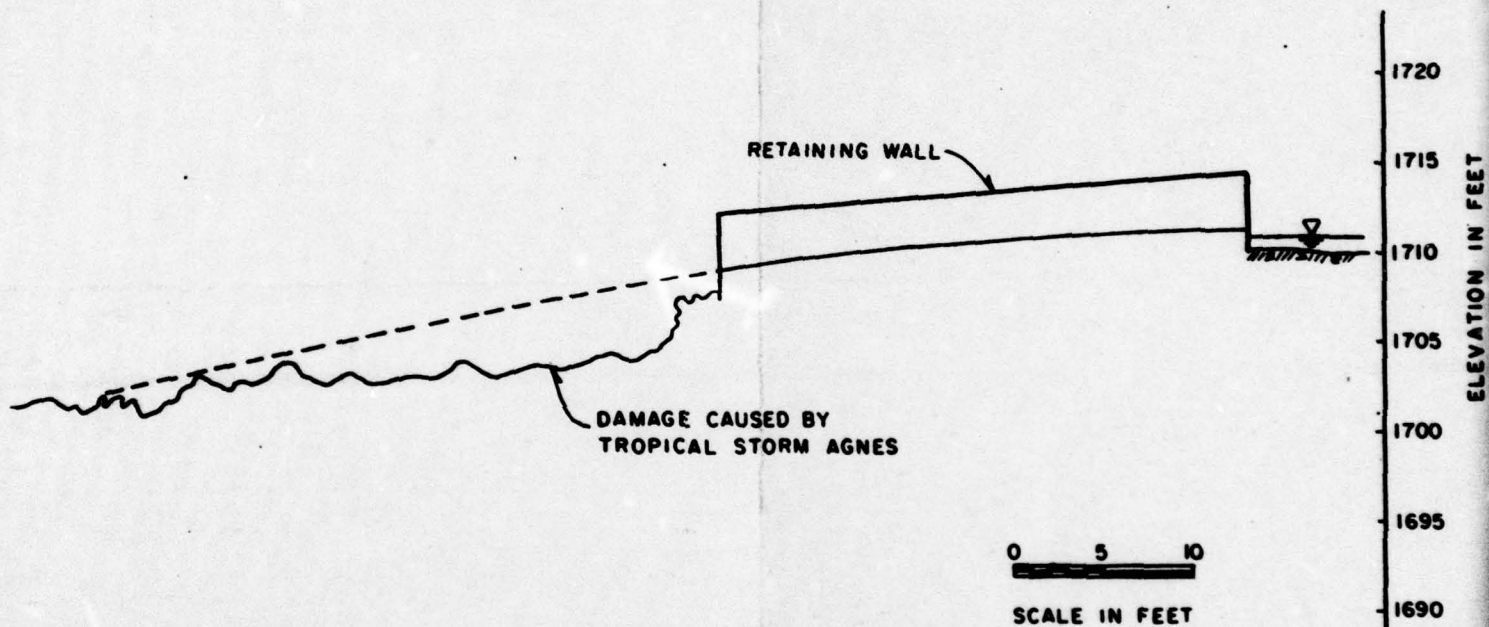
DATA OBTAINED FROM FIELD SURVEY, 10 APRIL, 1979

PLATE 4

PLAN



PROFILE



SECTION B-B

**PLAN AND PROFILE OF SPILLWAY
POLE RUN DAM NO. 4**

NAT.I.D.NO.PA.00888

SCHUYLKILL COUNTY

DATA OBTAINED FROM FIELD SURVEY, 10 APRIL, 1979

PLATE 5

APPENDIX

F

SITE GEOLOGY
POLE RUN DAM NO. 4

Pole Run Dam No. 4 is located in the Appalachian Mountain Section of the Valley and Ridge Physiographic Province. As shown in Plate F-1, the bedrock underlying the dam site area consists of the Pennsylvania Age Pottsville Formation. The predominant rock types in the Pottsville and other formations in the area are sandstone and conglomerate with interbeds of shale and coal locally. The dam site, as is much of central Pennsylvania, is completely folded and faulted. The regional bedrock structure is characterized by a series of northeast to east-northeast trending folds and faults. The dam site is located on the south limb of an east-northeast trending anticline (upfold) and between two easterly striking thrust faults. The region approximately 2,500 feet south of the dam site has experienced much folding and faulting and has been extensively mined for coal.

Except for numerous conglomeratic sandstone boulders, no bedrock exposures were encountered during the field investigation. However, based upon published Pennsylvania geologic maps, the bedrock in the dam site area strikes from near east-west to east-northeast with a southerly (downstream) dip.

